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Cost Effectiveness of Web Based Learning

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Abstract

The shift in the learning model needs lecturers and students to be able to adopt technology in the teaching and learning process. The use of technology in the learning process might result in new problems for teachers and students, particularly for those who are not familiar with the development of technology. This research aims to analyze the cost effectiveness in the web-based learning at Gunadarma University. The objects of this research are students and teachers of Cultural and Social Study classes. The observation was done in 2008 to 2010. To measure of the effectiveness of web-based learning, the students' scores in the final exams of the two subjects and students' satisfaction towards the teaching-learning process are used as parameters. The length of time allocated to teach the subjects is used to measure the efficiency. The result of the research shows that students who joined conventional class got better scores in Cultural and Social Study than those who took the two subjects in virtual class. Low satisfaction was also shown by students who joined virtual class. The length of time used by the teachers to deliver the materials in virtual class is similar with the time used to teach the two subjects in conventional class.

Keywords: cost effectiveness; effectiveness of ICT; efficiency learning; web based learning effectiveness

1. Introduction

The implementation of web based learning costs a lot of money, especially for the expenditures of infrastructures. The shift in the learning model requires lecturers and students to be able to adopt technology in the teaching and learning process. The use of technology in the learning process is expected

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to give more benefits and to increase the learning quality (Wing Lai, 2011; Pamfilie, Onete, Maiorescu, & Plesea, 2012). On the other hand, this model might result in new problems for teachers and students, particularly for those who are not familiar with the development of technology.

The web based learning in Gunadarma University has been implemented since 2006. The implementation of this program needs to be evaluated so that its objectives can be achieved successfully. This research aims to portrait the web based learning used by teachers in teaching Cultural and Social Study classes. The research was done after the process of teaching learning has been implemented for 2 years.

The development of the latest technology provides opportunities to choose and to use it in the learning process. Technically, the use of technology in the learning process must be efficient. Besides, the choice of using technology must consider its effectiveness in the learning process (Zhang, Zhao, Zhou, & Nunamaker, 2004). The efficiency can be measured by using large number of resources used to achieve certain goals (Daft, 2009). In the web based learning, efficiency can be pursued if the institution uses less number of resources (Crawford & Bryce, 2003; Daft, 2009).

In web based learning, effectiveness denotes the achievement of the objectives of the web based learning program (Crawford & Bryce, 2003). Nicol and Coen (2003) and Jung (2005) measured the effectiveness of web based learning by employing students' satisfaction, students' motivation and learning outcomes. Zhang, Zhao, Zhou, & Nunamaker (2004) states that students' satisfaction could be used as an indicator to measure effectiveness in the learning process. Students' satisfaction in the virtual learning is partly influenced by the interaction during the learning process (Shea, Federicksen, Pickett, Pelz, & Swan, 2002; Zhang, Zhao, Zhou, & Nunamaker, 2004). There are three kinds of interactions in the learning process, namely: 1) the interaction between students and the materials, 2) the interaction between students and teachers, and 3) the interaction between students and their friends (Rourke, Anderson, Garrison, and Archer, 2001). The research done by Yeh (2008) showed facilitators with higher performance will result in effectiveness in improving students' performance.

2. Methodology

The objects of the research are students who take Cultural and Social Study classes and the teachers who teach those subjects. The observation was done in 2008-2010. The measurement of the effectiveness is based on the students' scores in final test and students' satisfaction. The data of the students' scores are taken from the database of Gunadarma University. Meanwhile, the students' satisfaction is obtained from the results of the interaction between students and the materials, between students and teachers, and between students and their friends. The information about the students' satisfaction is gained from the answers towards questionnaires in Likert's scales using 1-5 scores. Score 4, in the questionnaires, indicates that students are satisfied with the web based learning. Questionnaires are distributed to students in the end of semester after they attended Cultural and Social Study classes.

The allocated time to deliver the materials is regarded to be the comparative indicator in analyzing the effectiveness. The process of web based learning is assumed to be efficient if the span of time used by the teacher in virtual class is shorter than the time used by the teacher in conventional class. The allocation of time used by the teachers is gained from the questionnaires distributed to the teachers who teach the two materials in virtual class and conventional class in the end of the semester.

3. Result

3.1. Students' Satisfaction

Based on the 250 questionnaires obtained during the observation, the scores of the students' satisfaction are presented in Table 1. The scores of the students and their satisfaction in the Likert scales are compared in that table. This can be seen that students are not satisfied with the interaction during the web based learning. The kinds of questions written in this part include variations of materials, the availability of the link, access speed from inside and outside campus, the quality of the animation, the quality of sounds, the quality of the picture and the adjustable navigation. The low satisfaction is shown in the responds of the students toward sounds and animations of the websites.

Table 1. Students' Satisfaction in Learning ISD and IBD

Interaction	Score	
	measured	**statisfied**
Interaction between Students and Learning Material	**6659**	**8000**
Interaction between Students and Teacher	**4644**	**6000**
Interaction between Students and Students	**2135**	**3000**

Only few learning materials are delivered using sounds. This is due to the fact that sounds will influence the speed in accessing the materials. The same explanation also happened in the animation. Generally, the web based learning materials use simple animation. The use of sounds and animation will reduce the speed during the process of accessing the materials. To solve this problem, the capacity of the network needs to be improved. Besides, special skills in animation are needed to design an interactive materials. This condition shows that the effectiveness in learning is influenced by the selection of the technology that will be implemented (Rumble, 2003; Mendes, Watson, Triggs, Mosley, & Counsell , 2007).

Based on the data obtained, the interaction between students and teachers is still low. The punctuality of the teachers to attend the virtual class and the length of time in giving the responds has the lowest score among 6 other indicators being measured. The scores of the interaction among students are also low. This shows that discussion forum has not been optimally used by students.

Virtual learning not only enables students and lecturers to interact each others without depending on the class and time but also allow students and lecturers to set learning schedules freely. Yet, flexibility in terms of time did not contribute positive significance to the interaction between students and lecturer, such as in terms of answering students' questions and facilitating discussions. Discussion and feedback in web based learning could not be conducted as easy as in the class. This process needs longer time than the activity which is done in the class.

In general, based on the three measured satisfaction of interaction, it could be concluded that the process of web based learning is still ineffective in accordance with the scores of the satisfaction on interaction fell behind satisfaction score of Likert scale.

3.2. The Results of the Final Test

The scores of the final test of the students in conventional class are different from those who joined virtual class (Table 2). This can be seen from the data obtained that the average score is 58 in virtual class and 62 in conventional class. This deviation is assumed to be significant based on t-test (significant score 0.0000). The students who attend conventional class got higher scores than those who joined virtual class. One of the factors that cause such situation is that the communication to deliver the materials is not effective. This situation is also happened in the students' satisfaction (Table 1) that shows

the score of the interaction which is low for the interaction between students and teachers, the interaction between students and learning materials, and between students and their friends. This research is in line with Shea, Federicksen, Pickett, Pelz, & Swan (2002), and Zhang, Zhao, Zhou, & Nunamaker (2004) who state that the interaction during the learning process might result in the effectiveness or ineffectiveness.

Table 2. Means Test in Conventional Class and Virtual Class

	Method	N	Mean	Std. Deviation	Std. Error Mean
Score	Virtual class	1871	58.1970	17.69755	.40914
	Conventional class	1275	62.3967	13.46769	.37717

	t-test for Equality of Means		
	T	Df	Sig.(2-tailed)
Equal variance assumed	-7.175	3144	.000
Equal variance not assumed	-7.547	3106.156	.000

3.3. Time Allocation of Teachers in Web Based Learning

The information of the research was gained from 13 teachers who teach Cultural and Social Study in conventional class and 20 teachers in virtual class. Two of the teachers got the first experience to teach in a virtual class. The number of the students in virtual class ranges from 20-50 students.

Table 3. Time Allocation of Teachers

Activity in Conventional Class (per subject)	**Time Allocation (hour)**	**Activity in Virtual Class (per subject)**	**Time Allocation (hour)**
Preparation Learning Materials	1-2	Preparation Learning Materials	1-2.5
Delivering Learning Materials	2x 50 minutes	Uploading Learning Materials	0.5-1
		Quiz/Assignments	0.5
		Discussion	0.5-2

Table 3 shows the time allocated to teach in virtual class and conventional class is not so different. Based on Table 3, the time allocated to teach is more efficient if the process of uploading the learning materials, quiz or assignments can be done in the classes who are taught by a teacher. In the example, the navigation of web based learning does not enable a teacher to upload materials to several classes at a time, so the fact that it is inefficient cannot be seen directly.

Based on interviews conducted during the process of collecting data, there is an impression that the teacher was not too enthusiastic about presenting the material in cyberspace. This is due to the fact that they have to spend more efforts compared with the conventional classroom, especially in forum discussions. During the discussion, not all students are online. So, the same questions come up again. It explains that making a question through the websites is more difficult than answering the question directly. Low motivation in the web based learning is also shown by most of the teachers. They do not provide time for discussion. Discussion is only done by 30% of teachers. This condition will get worse if the ability of lecturers in the virtual material design and the ability to use technology is low.

4. Discussion

The use of visualization and sounds in the web based learning should increase the students' understanding (Pamfilie, Onete, Maiorescu, & Plesea, 2012). The communication between students and teachers are conducted through pictures and sounds. Therefore, the absence of direct conventional might

not be the reason for the ineffectiveness in the learning process. To minimize the problems, this learning needs mentoring (Pamfilie, Onete, Maiorescu, & Plesea, 2012). This problem can also be overcome by conducting one conventional class in one semester.

Another problem which may appear is the material preparation. One of the necessary skills which should be performed by the teacher is designing an interactive material. The form of material which will be presented in web based learning is different from the material that will be given through face to face learning in class. Web based learning material must be well-prepared. The process of designing such material takes more time. Designing interactive material requires lecturer's creativity without putting aside pedagogical aspects in the process of learning. The effectiveness can be achieved through the interactive communication (Wing-Lai, 2011). Therefore, the training on the use of technology to design teaching materials and features in the websites needs to be held before the implementation (Jungert & Rosander, 2010).

Several things must be prepared by teachers as facilitators in the web based learning. They are as the following: commitment in the implementation, skills in utilizing technology, and creativity in designing web based learning material. The low score of punctuality in the attendance and feedback speed is caused by the lack of commitment and insufficient skills of the lecturers in using technology. These low scores show that the learning process is still ineffective as what Zhang, Zhao, Zhou, & Nunamaker (2004) state that low quality of interaction can reduce effectiveness of web based learning.

The results of students test in the web based learning is lower that those who join conventional class. This finding is in line with Jung (2005) who state that this is due to the limitation of technology use. In this institution is due to the absence of communication among the students, materials, and teachers. The ability of the teachers to design web-based materials holds important roles (Yeh, 2008; Wing-Lai, 2011; Subramaniam & Kandasamy, 2011) so that the materials presented in the websites are easy for students to understand.

When there is no difference in the length of time used to teach materials in the web based learning and conventional class, this situation may result in the inefficient learning process. The finding of this research is on the contrary with Bartley and Golek (2004), and also Bayrak and Kesim (2005), who state that web based learning is more efficient than conventional learning. This situation may happen and depend on the web-design used. The features and navigations employed in the websites must be appropriate with the materials (Yeh, 2008; Jungert & Rosander, 2010; Cheung &Hew, 2011). The concept of parallel class is no longer implemented in such kind of learning. A teacher must be able to deliver the materials to all of students who take the subjects.

The procedures to join the lesson through websites must be clearly stated, such as the length of time for students to learn a material, schedules for discussion, date to submit the assignments. The explicit and understandable schedules will enforce students and teachers to work in the same time (Subramaniam & Kandasamy, 2011). Thus, similar questions can be avoided. All students involved in the web based learning are able to get similar information. Questions or problems encountered by students can be discussed with the teachers and also with other students. In this case, the commitment of teachers and students hold important factors in the success of this learning process.

5. Conclusion

The shift in the model of teaching and learning in conventional class needs established infrastructures from the institution and also the changes in the behavior the personnel involved in the learning process, particularly teachers and students. The shift of behavior and cultures in using technology is absolutely needed in order to optimize the learning process. The commitment and skills to use technology in the process of learning also need further intentions.

Efforts of optimizing the utilization of web in learning need supports in the form of policies from the institution. Training on the use of technology in the teaching learning must be sustainable. This condition regards that the teachers must possess special skills to be able design interactive materials in the websites. The institution must evaluate the web designs such as features, navigations, speed access so that the communication during the teaching and learning process will run smoothly, effectively and efficient. Furthermore, the procedures in the web based learning must be clearly stated so that the students and teachers are able to follow all procedures well.

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